

OTS: 60-11,971

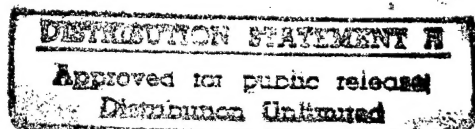
JPRS: 5074

1 August 1960

INTER-INSTITUTIONAL CONFERENCE ON THE APPLICATION OF  
PHYSICAL AND MATHEMATICAL MODELLING TO  
ELECTRICAL ENGINEERING PROBLEMS

- USSR -

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19980205 159

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NEW YORK 17, N. Y.

[DTIC QUALITY INSPECTED 3

JPRS: 5074

CSO: 4147-N

INTER-INSTITUTIONAL CONFERENCE ON THE APPLICATION OF  
PHYSICAL AND MATHEMATICAL MODELLING TO  
ELECTRICAL ENGINEERING PROBLEMS

[This is a translation of an article written by  
A. V. Ivanov-Smolenskiy and I. M. Tetel'baum in  
"Izvestiya Vysshikh Uchebnykh Zavedeniy -  
Elektromekhanika", No. 1, Novocherkassk,  
January 1960.]

The inter-institutional conference on the application of physical and mathematical modelling to electrical engineering problems, that took place in the Moscow electric power institute from the 26th to the 30th October 1959, as in the case of the previous conference in 1957, had as an objective the mutual exchange of results of actual experience.

About 600 representatives of educational and scientific research institutes, planning organizations and industrial enterprises of the Soviet Union took part in the work of the conference, together with representatives from Poland, Czechoslovakia and the Chinese Peoples Republic.

The conference work was subdivided into two sections: physical modelling and mathematical modelling.

The physical modelling section listened to 52 reports and communications presented by 14 organizations; in the mathematical modelling section a total of 57 reports and communications by 37 organizations were presented. The presentation of all reports was followed by a lively exchange of opinions.

As compared to the 1957 conference, the area of investigation of physical and mathematical modelling methods was widened considerably. The following problems were studied at the section of physical modelling:

a) general problems of the similarity theory and modelling as applied to problems of electrical and electric

power engineering (reports by V. A. Venikov (MEI), I. M. Kirko (Acad. of Sci. of the Latvian SSR), N. N. Tikhodeyev (NIIPT) and V. M. Breytman);

b) application of physical modelling and of the similarity theory to the investigation of electromagnetic phenomena:

in electric engines - A. V. Ivanov-Smolenskiy (MEI), Ya. B. Danilevich (IEM of the Acad. of Sci. USSR);

in magnetic hydrodynamics - I. M. Kirko, M. V. Filippov, O. A. Lielausis, A. E. Mikel'son (physics institute of the Latvian SSR Acad. of Sci.);

in ferromagnetic cylinders and in magnetic fields and electromagnets - I. M. Kirko, T. K. Kalnin', G. K. Grinberg (physics institute of the Latvian SSR Acad. of Sci.);

in magnetic amplifiers and steel core reactors - E. Ya. Yakubaytis and V. P. Glukhov (electric power and electric engineering institute of the Latvian SSR Acad. of Sci.);

in the arc and in the corona - A. S. Maykopar (VNIIE) and G. N. Alexandrov (LPI);

c) application of physical modelling and of the similarity theory to the study of certain non-electric phenomena in electric power installations:

mechanical phenomena - I. D. Urusov and V. F. Fedorov (IEM of the Acad. of Sci. USSR);

thermal and hydraulic phenomena - V. P. Anempodistov and N. N. Anempodistova (IEM of the Acad. of Sci. USSR);

d) application of the similarity theory to the solution of economic-engineering problems (V. A. Venikov, Yu. N. Astakhov (MEI) and V. G. Kadeyshvili (Georgian SSR Acad. of Sci.):

e) designing and planning methods for dynamic and static models of direct and alternating current electrical systems:

synchronous generators - L. A. Sukhanov and E. G. Kosharskiy (IEM of the Acad. of Sci. USSR);

transformers - L. A. Sukhanov, V. K. Sirotko, G. M. Smolin (IEM of the Acad. of Sci. USSR); M. S. Libkind, V. A. Tsvetkov (ENIN of the Acad. of Sci. USSR);

transmission lines - V. I. Ivanov, V. K. Sirotko, G. M. Smolin (IEM of the Acad. of Sci. USSR);

conversion systems - A. V. Stukachev and N. S. Lazarev (VEI);

primary synchronous generator motors - A. A. Aslamazyan (IEG of the Armenian SSR Acad. of Sci.) and D. V. Nikitin (MEI);

f) study of operating regimes of electrical systems:

by means of electrical system models - V. V. Voskresenskiy, Kh. F. Barakayev, L. V. Travin (VEI) and I. D. Urusov and V. F. Fedorov (IEM of the Acad. of Sci. USSR);

by means of mathematical machines of continuous operation - Yu. M. Gorskiy (MEI), V. S. Tarasov, A. I. Vazhnov, Yu. V. Rakitskiy, V. V. Popov and A. N. Semenov (LPI), Ya. N. Luginskiy, M. G. Portnoy (VNII), G. V. Mikhnevich, G. F. Kozlovskiy (ENIN of the Acad. of Sci. USSR).

The following were discussed at the conference:

a) the modelling of fields in continuous media:

study and adoption of methodology and instrumentation for the modelling of fields by means of electric conductive paper. This problem was discussed by the following: P. F. Fil'chakov and V. I. Panchishchin (mathematical institute, Acad. Sci. USSR), N. I. Druzhinin (VIGM), M. M. Litainov (TsIAM), V. R. Buldey (Academy of construction and architecture of the UkrSSR), A. A. Glushchenko (KGU), G. A. Ryazanov (Leningrad water industry institute), A. F. Fokin (VITR), A. S. Rozenkrants (IEI);

new work in the area of construction and use of trajectory graphs: G. A. Tyagunov, K. A. Gorozhankin, A. A. Zhigarev, G. P. Prudkovskiy, E. N., Tsyganov (MIFI),

I. M. Bleyvas (NII MRTP), E. E. Bykhlovskaya, A. M. Kharchenko (institute of radio engineering and electronics);

new applications of the continuous media method:  
Yu. A. Birzvalk, L. V. Nitsetskiy (Latvian SSR Acad. Sci.),  
E. K. Yankon (Riga polytechnic institute), K. S. Demirchan,  
V. V. Pruss-Zhukovskiy (LPI), G. Ya. Murav'eva and V. N.  
Rudakov (LETI), K. P. Tepilin (NII GKS), N. I. Druzhinin  
(VIGM), G. A. Ryazanov (Leningrad water industry institute);

b) use of electrical networks, calculating boards  
and chain substitution circuits:

development of new types of electrical networks and  
installations in conjunction with them - P. M. Belash and  
G. M. Zdorov (All-union petroleum-gas NII), K. N. Seleznev  
and A. I. Taranin (TsKTI imeni Polzunov), M. D. Golovko  
(TsNIIS of the ministry of transport construction), A. I.  
Leushin (Kuybyshev industrial institute), G. E. Pukhov  
(calculation center, Acad. Sci. UkrSSR), new applications  
for networks and chain circuits in problems of underground  
hydraulics - P. M. Belash, A. L. Goflin (All-union petrol-  
eum-gas NII), heat transfer - A. T. Lavrov and A. E.  
Surminskiy (TsIAM), theory of elasticity - V. M. Samus  
(Kiev institute GVF), N. V. Korol'kov (VTs Acad. Sci. USSR),  
L. V. Nitsetskiy (Latvian SSR Acad. Sci.), A. K. Kuznetsova  
(NIS of the hydroproject), A. V. Amel'yanchik (TsIAM) and  
study of magnetic chains on calculating boards - A. S.  
Rozenkrants (Ivanov electric power institute);

c) study of iterative installations of continuous  
action with a consecutive digest of the information for the  
solving of equations of partial derivatives: G. E. Pukhov  
(Kiev institute GVF), L. A. Vulis, A. T. Luk'yanov,  
A. A. Kostritsa, N. U. Isayev (Kazakh state university),  
I. M. Tetel'baum (MEI);

d) modelling problems of dynamics: I. K. Pchelin,  
A. S. Golovanov (TsNIIS), I. M. Tetel'baum, N. I. Chelnokov  
(MEI), A. M. Ashavskiy (TsKB of the Ministry of geology of  
the USSR), A. A. Khachaturov, I. K. Pchelin (Moscow motor  
highway institute), R. V. Roytenberg (VABTV), A. E.  
Ordinovich (physics faculty MGU), A. T. Lavrova (TsIAM),  
A. V. Dabag'yan (KhPI), V. A. Bebikhov (GIFTI), O. L.  
Shekhter (institute of bases and foundations);

e) study of new model-analog assemblies of non-  
linear dynamic systems: Yu. L. Kozlenko and P. N.  
Kuprianchik.

In connection with articles in the press that discussed physical as opposed to mathematical modelling\*, the conference noted that setting up physical modelling against mathematical, in the same manner as setting up experimentation against analysis is injurious to the development of the theory and practice of scientific investigations.

The conference recommended that all workers in the field of modelling more precisely define the assumptions made when carrying out investigations on models. They should also define with greater precision the accuracy of the initial parameters and as a function of changes in the values characterizing the process.

The accuracy of modelling generally, and that of electric power systems, in particular, is determined not only by the modelling installation itself, but by the accuracy of initial parameters and as functions of various physical values.

In this connection the conference recommends that factories manufacturing electrical machines, transformers, reactors and so forth specify in technical documentation the guaranteed accuracy of determination of the parameters and the conditions under which they would possess guaranteed values (as is done, for example, in the case of efficiency ratings of electric engines).

With the aid of the appropriate scientific-research institutes and institutions of higher learning, factories must develop methods of calculating parameters as a function of saturation and frequency.

In connection with the development of methods of physical and mathematical modelling and the use of mathematical machines, the conference found it necessary to initiate a gradual change in the method of teaching mathematics, physics and technical subjects along the lines of a more careful statement of a whole series of problems; introduce in the curriculum the study of the basis of computation techniques, mathematical and physical modelling; to recommend a wider utilization of physical and mathematical modelling in laboratory practice and in lectures on experimentation.

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\*See, for example, discussion in the journal "Elektrichestvo" for 1958.

The conference noted that the development of modelling technique is impeded by the absence of materials, parts and assemblies used in modelling, as well as amplifiers, conductive paper, portable resistance boxes, inductions and capacities, model-analog assemblies and mathematical machines. The conference deems it essential that their manufacture be organized on an industrial scale.

The conference recognized the need for wider treatment of the work being done on modelling in periodical literature. It recognized the need to conduct an exchange of experience in that work in the field of modelling as between the interested organizations and resolved: to request the editors of the journals "Elektrichestvo" and "Elektromekhanika" to organize a special section devoted to physical and mathematical modelling.

A. V. IVANOV-SMOLENSKIY  
Chairman, section on physical modelling

I. M. TETEL'BAUM  
Chairman, section on mathematical modelling

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